Kelvin-Helmholtz instability for flow in porous media under the influence of oblique magnetic fields: A viscous potential flow analysis

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Abstract:

In this paper, the Kelvin-Helmholtz instability of viscous incompressible magnetic fluid fully saturated porous media is achieved through the viscous potential theory. The flow is considered to be through semi-permeable boundaries above and below the fluids through which the fluid may either be blown in or sucked out, in a direction normal to the main streaming direction of the fluid flow. An oblique magnetic field, mass, heat transfer, and surface tension are present across the interface. Through the linear stability analysis, a general dispersion relation is derived and the natural curves are plotted. Therefore, the linear stability condition is discussed in some depth. In view of the multiple time scale technique, the Ginzburg-Landau equation, which describes the behavior of the system in the nonlinear approach, is obtained. The effects of the orientation of the magnetic fields on the stability configuration in linear, as well as nonlinear approaches, are discussed. It is found that the Darcy’s coefficient for the porous layers plays a stabilizing role. The injection of the fluids at both boundaries has a stabilizing effect, in contrast with the suction at both

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